

Testimony for Funding Request

Kevin G. Nelson, PE, PLS – City Engineer

City of Lincoln, North Dakota

Request

The City of Lincoln (City) respectfully requests consideration for \$7 million in funding from the legislature.

Purpose

The requested funding will provide necessary improvements to the City's wastewater treatment system to alleviate stress on the system caused by fast growth in population this past decade. Currently, the City has a lagoon treatment system. This system has become undersized because of the City's growth.

Objective

The City is planning a project to regionalize the wastewater treatment system with the City of Bismarck. The project will involve reclaiming nearly 90 acres of land that the current lagoons occupy and installing a pumping station and piping to take the wastewater to Bismarck for treatment.

Background

Lincoln was one of the fastest growing communities in North Dakota from 2010 to 2020. The population growth exceeded expectations and projections. According to projected growth, the City planned to expand the wastewater treatment facility around the year 2028. However, because population growth was more robust than projections anticipated, the City has outgrown the current treatment system sooner than expected. Therefore, improvements to the treatment system are needed sooner than the City planned. Consequently, funding for the needed improvements is not currently available in the City's budget.

In 2019, the City felt the impact of wastewater flows exceeding the treatment facility's capacity. Not only did flows to the facility reach the design capacity of the system, but the exceptionally wet year exacerbated the issue. With inflow from frequent rainfall, the ponds quickly exceeded their storage capacity. Consequently, the City had to discharge the system six times throughout the year whereas the system is normally discharged only twice a year.

North Dakota Department of Environmental Quality (NDDEQ) has established standards for wastewater treatment facilities, including lagoon systems like Lincoln's. Their standards require 180 days of storage in a lagoon system for treatment. This equates to discharging a lagoon system twice a year. Discharging more frequently than this runs the risk of discharging wastewater that is lower quality than what is desired. Since Lincoln discharges into Apple Creek, which drains into the Missouri River, the risk is that lower quality water could negatively impact these two sensitive bodies of water.

Addressing the capacity issue requires expanding the current system, changing the system to provide higher quality treatment in a shorter time, or eliminating treatment on site by combining with another system. Expanding the current lagoon system would require land acquisition, earthmoving, pumping

system, and piping. Lagoon systems are the preferred treatment system for small communities because of their ease of operation. However, they require vast expanses of land, which becomes impractical for larger communities. At some point, the lagoon system for Lincoln will not be practical and another system will be needed for treatment.

Basically, two types of treatment exist for wastewater streams. One is a lagoon system and the other is a mechanical plant system. Changing Lincoln's treatment system, then means installing a mechanical plant system. One major concern with this approach is that Apple Creek freezes over in the winter. As a result, discharge to this water body would need to be suspended over the coldest winter months. Therefore, open ponds will still be needed to store the treated wastewater until after the spring thaw and spring flooding (during years that Apple Creek floods). This requirement of needing storage ponds carries the same concerns of capacity as a lagoon system.

Combining with another treatment system is known as "regionalization." Regionalization benefits the sender of the wastewater but also the receiver because of the economies of scale inherent in combining the waste streams. Regionalization provides a more consistent stream flow for more predictable loading to the treatment plant. For Lincoln, regionalization means combining with Bismarck, sending Lincoln's wastewater to Bismarck for treatment. The benefits are that Bismarck already has a mechanical treatment plant that discharges high-quality treated water to the Missouri River. Consequently, Lincoln gets its wastewater treated by a mechanical plant without the costs of building or directly operating a mechanical plant. Operating a mechanical plant would require Lincoln to hire an operator who is licensed to run the plant.

Bismarck benefits from regionalization, too. Not only does regionalization with Lincoln provide a more consistent and continuous flow to Bismarck's plant, but it also provides a revenue stream for Bismarck to use as a utility fund to help generate revenue for operation, maintenance, and future improvements.

Lincoln benefits from regionalization by getting a reliable and scalable treatment system that will be capable of handling increased loading due to growth. As Lincoln continues to grow, we will work with Bismarck to project and plan for future expansions for the Bismarck treatment facility.

Project

The City has completed a Facility Plan for the wastewater treatment system to address the capacity issue. This plan considered several alternatives for improvements to the treatment system. These alternatives included expanding the existing lagoons, regionalizing with Bismarck, or installing a mechanical treatment plant. Two types of mechanical plants were looked at for this last alternative. The alternative of regionalizing with Bismarck has the lowest capital cost to implement. As a result, it is the alternative selected by the City Council to implement.

Lincoln approached Bismarck to request discussing regionalization. Bismarck's City Commission approved that request, and we are currently working with Bismarck's Public Works Department toward an agreement on regionalization. Lincoln is in the process of preparing a request for proposals (RFP) for engineering services to design the project. The design is expected to be completed this winter with construction to begin in the spring of 2022. Construction will be complete late fall of 2022, with startup planned for early winter of that year.

Closing Remarks

In 2019, Lincoln experienced capacity limitations on our wastewater treatment lagoons because of faster population growth than we expected and because of the high amounts of precipitation seen that year. The past two years have been unusually dry. As a result, we did not have a need to discharge our treated wastewater more frequently than usual, as we did in 2019. However, when we return to a more normal precipitation pattern, Lincoln will again feel the stress of limited capacity with its treatment system.

Our system is at risk of failing within a year. Consequently, we are in the process of selecting an engineering firm to design a regionalization project. Our need for funding this project is extremely urgent.

The City of Lincoln is aware of the City of Bismarck's request to the legislature for funding for improvements to Bismarck's wastewater system. Lincoln supports Bismarck's request for that funding, knowing those improvements are necessary for regionalization with Lincoln. Lincoln urges the legislature to provide funding to Bismarck for improvements to their wastewater system and to Lincoln to overcome the deficiencies in Lincoln's treatment facility due to exceptionally high growth.

Thank you for your consideration of the City of Lincoln's request for \$7 million in funding to provide relief from capacity issues with our wastewater treatment facility.

Attachments:

Letter to Senator Poolman, requesting consideration for funding

Excerpts from Lincoln's Facility Plan for the Wastewater Treatment Facility



October 6, 2021

Nicole Poolman
Email: npoolman@nd.gov

Dear Nicole Poolman:

The City of Lincoln is requesting consideration for \$7 million in funding from the legislature for a project to regionalize our wastewater system with the City of Bismarck for treatment by Bismarck.

The City of Lincoln currently utilizes a lagoon system for treating wastewater. Our current lagoon system has exceeded its capacity for the number of residents in the city and is at risk of failing within a year. During the wet year of 2019, the treatment facility exceeded capacity several times, requiring us to discharge our lagoons six times to prevent illegal bypasses (water overtopping the lagoon dikes). We usually only discharge twice a year.

Twice-a-year discharge complies with standards accepted by the North Dakota Department of Environmental Quality. It provides 180 days of treatment to improve water quality prior to discharge. Discharging more frequently than twice a year runs the risk of lower quality water being discharged because it has not been treated as long.

Additionally, since 2019 we have added 30 additional single-family homes to our community. This equates to approximately 130 users or 3% increase in wastewater to be treated. We expect to add 25 more homes in the next two years which will increase flows another 2.5%. While these increases may appear to be small, one needs to keep in mind that our treatment facility is already over capacity, so any increase puts us in greater risk for a failure of the system.

With anticipated growth, when we have another wet year (or a year with normal precipitation) we may be in jeopardy of discharging lower quality water or experiencing an illegal bypass. Either of these situations could result in substantial financial penalties assessed to the City of Lincoln. Therefore, we must make improvements to our treatment facility. This issue is urgent so we do not degrade water quality in Apple Creek and the Missouri River.

In looking at alternatives for our wastewater treatment needs, we looked at several alternatives, including expansion of the existing lagoon system, regionalization with Bismarck, or a couple of alternatives for a mechanical treatment plant. Regionalization with Bismarck was the lowest capital cost alternative (see attached excerpt from our Facility Plan).

According to the 2020 census, Lincoln was one of the fastest growing communities in North Dakota from 2010 to 2020. That growth has continued in 2021 and is expected to continue for the foreseeable future due to Lincoln's proximity to Bismarck and our attractive tax structure,

making our community very desirable to first time homeowner and lower income families. However, with growth come challenges. The most significant challenge we currently have is our wastewater treatment facility. We will be limited in our growth, unless we make improvements to that system.

Not only is regionalization with Bismarck the lowest capital cost alternative but it is also mutually beneficial to both communities. Lincoln benefits because we will have a reliable and scalable treatment system that will be capable of handling increased loading due to growth. Bismarck benefits because they will have a partner and revenue source to help offset some capital improvement costs for plant upgrades in the future and to help pay costs of operations of their treatment facility.

Lincoln has completed a facility plan that considered multiple alternatives to address our capacity issue. That plan identified regionalization with Bismarck as the preferred alternative. Lincoln approached Bismarck to request discussing regionalization. Bismarck's City Commission approved that request, and we are currently working with Bismarck's Public Works Department toward an agreement on regionalization. Lincoln is in the process of preparing a request for proposals (RFP) for engineering services to design the project. We will have the design completed this winter and plan to begin construction in the spring of 2022. Construction will be complete late fall of 2022, with startup planned for early winter of that year.

The City of Lincoln supports Bismarck's request for funding to provide necessary improvements to their wastewater treatment facility, some of which are required to allow Lincoln to regionalize with Bismarck.

Should you have questions regarding this information, please do not hesitate to contact me at (701) 955-3153.

Mountain Plains, LLC

A handwritten signature in blue ink, appearing to read 'Kevin Nelson', is written over a faint, larger blue signature that appears to read 'Kevin Nelson'.

Kevin G. Nelson, PE, PLS
City Engineer

Wastewater Treatment Facilities Plan Amendment

Lincoln Wastewater Treatment Facility

Prepared for City of Lincoln, North Dakota

6 Selection of an Alternate

The selection of an alternative can be accomplished by evaluating the construction cost, ongoing operation and maintenance, and lowest overall cost during the service life of the project. Operations and Maintenance associated with the wastewater treatment alternatives varies by alternative. In order to compare the alternatives, an annual cost was calculated for each of the proposed alternatives. The annual cost was used to develop a 20 year net present value for each alternative which allows for a cost comparison for both initial capital expense and ongoing operation and maintenance costs. Table 20 shows the present worth analysis.

Table 1 – Probable Cost for Evaluated Alternatives

Alternative	Anticipated Annual Operator Labor Hours	Preliminary Opinion of Probable Cost		
		Capital Cost ¹	Annual O&M Cost ²	20 Year Present Value ³
5.1 - Expansion of Stabilization Pond System	960	\$10,270,000	\$106,000	\$11,847,000
5.2 - Regionalization with Bismarck	730	\$7,212,000	\$547,000 ⁴	\$15,338,000
5.3.1 - Continuous Discharge Aerated Pond Mechanical Facility	1,630	\$12,420,000	\$210,000	\$15,539,000
5.3.2 - Continuous Discharge BNR Mechanical Facility	2,290	\$17,260,000	\$224,000	\$20,589,000
<p>1 Includes the following: 30% construction contingency 16% for engineering design, construction administration, and construction field services.</p> <p>2 Assumes operator total compensation labor rate of \$35.00 per hour for 5.1, 5.3.1, and 5.3.2 and \$25/hour for 5.2.</p> <p>3 20 year period at 3.0% rate.</p> <p>4 Wastewater user fee paid to Bismarck is \$522,145 per year at year one, increasing by 3% per year due to inflation. Assumes current flow and population for annual O&M costs.</p>				

Alternatives 5.1, 5.2, and 5.3.1 were presented to the City of Lincoln council at the March 7, 2019 council meeting, where it was decided to include a fourth option of a BNR mechanical system. This fourth option was added, and the revised Facility Plan was forwarded to the City council members for preliminary review. Due to the cost of the alternatives, a public meeting was also held on May 14, 2019 to include public input on project selection. Two of the main comments by the public were 1) that wastewater ponds odor was unpleasant at certain times of the year, and there was desired to eliminate these odors and 2) that the next improvement should not result in larger expansion of ponds.

Once public input meeting was completed, the City council members reviewed the alternatives once again, and at the June 6, 2019 City council meeting it was motioned and carried to move forward with Alternative 5.3.2, Continuous Discharge BNR Mechanical Facility. The original Facilities Plan was submitted to the State with this being the recommended alternative.

After reviewing the costs of the BNR Mechanical Facility, the City chose to change to the Regionalization with Bismarck alternative at the June 4, 2020 council meeting. This alternate was selected due to the reduced capital cost and the compliance with the public comments noted above regarding pond size and odors. The following sections outline the preliminary project design and cost associated with the Regionalization with Bismarck alternative.

7 Proposed Project

7.1 Project Design

The City of Lincoln has selected Alternate 5.2, regionalization with the Bismarck WWTP. The Bismarck WWTP is located approximately 4.7 miles west of the Lincoln wastewater pond system. The Bismarck facility has an average day flow treatment capacity of 9.25 MGD with 11 plant operators. The plant was recently upgraded in 2009 and has additional upgrades scheduled in 2021 to increase the BOD capacity. The Bismarck WWTP will be available for City of Lincoln flows starting in 2022.

In order to discharge to Bismarck's sanitary sewer, Lincoln will need to meet Title 11.1 Pretreatment Program Ordinance Bismarck uses to manage wastewater. Lincoln does not have categorical industrial users or significant industrial users and is not anticipated to need additional treatment prior to discharging to the Bismarck collection system. A sampling program is planned to further characterize Lincoln's wastewater characteristics as it pertains to pretreatment.

The proposed project is a conversion of the existing lagoon system to a regionalization system with City of Bismarck. The proposed system will decommission cells 1, 3 and 4 and re-purpose cell 2 as an equalization basin. A regionalization lift station would be constructed to pump wastewater to Bismarck's Hay Creek lift station utilizing a duplex submersible station in a precast concrete structure. Prior to entering the lift station, the influent will pass through a basket screen and grease trap to reduce ragging and grease buildup.

7.1.1 Flow Projections

A flow study was completed based on 2018 flows and a linear population projection (4,152 persons in 2020, 6,772 persons in 2040). The flow study produced the following 20 year design flows presented in Table 2.

Table 2 – Projected Flows

	Parameter	Units	Value
Flow Design Demand	Average Dry Weather Flow	gpd	313,000
	Average Wet Weather Flow	gpd	355,000
	Peak Hour Wet Weather Flow	gpm	589
	Peak Instantaneous Wet Weather Flow	gpd	848,000

7.1.2 Cell 2 Design

Cell 2 will be converted to an equalization basin to hold excess wastewater during high flow events. The cell will be divided by a berm, which will allow for one half to be taken offline for maintenance as needed. The cell will be filled and drained by gravity along the east side of the cells based on the water elevation in the wetwell: during peak flow conditions the water in the wetwell will back up into the pond cells by gravity. A manual valve on each EQ cell will control which cell is filled. When the wetwell has emptied to a low enough level, wastewater from the EQ cell will drain into the wetwell also by gravity. A check valve on the drainpipe will prevent backflow from the wetwell to the drain pipes. A 0.5% slope will be added to the floor of the cells to aid in gravity draining of the pond (Slopes west to east). Figure 1 presents the proposed layout of the EQ basins and lift station.

7.1.3 Lift Station Design

The duplex lift station is designed to meet the current peak flows of 421 gpm with one pump running, and the other as a backup. The wetwell is sized large enough to allow for future pump upsizing and for a potential third pump in the future.

The city indicated the need for both screening and grease removal. A basket screen with a railing system and a 20,000-gallon septic tank grease trap are recommended. Operators will need to empty the basket screen at least once per day, which will increase the required operation cost.

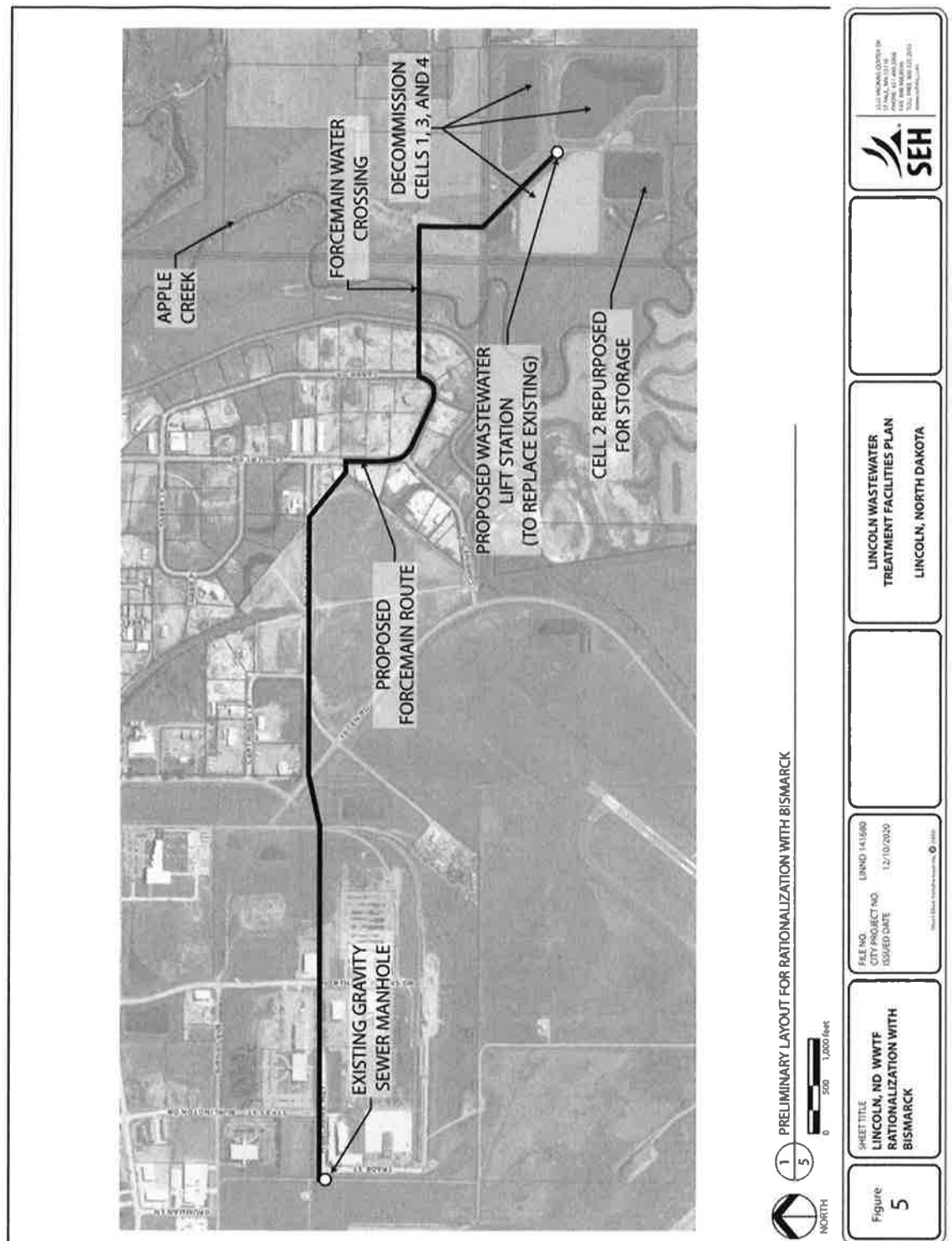
A chemical addition station and composite sampling station will be placed the lift station to monitor wastewater parameters and allow for chemical addition as required by the City of Bismarck.

7.1.4 Forcemain Route

The selected route for Regionalization is shown in Figure 2 and is approximately 12,500 linear feet. The route passes under Apple Creek and through residential, commercial, and city property. The route proposed in Figure 2 is longer than the presented route in Section 5.2 in order to minimize the length of forcemain under Apple Creek. The route may be altered during the design process based on the responses to the solicitation of views letters. The option of dual lines was also discussed in Section 5.2 in order to increase the capacity of the forcemain. After discussions with the City of Lincoln, it was determined that dual lines are not required for the flows at the current population, and therefore is not cost effective at this time. However, planning for the parallel forcemain will be considered in the design of the first forcemain to allow for simpler installation of the second line down the road.

A single 8" HDPE forcemain is proposed. The pipe can be installed open cut or directionally drilled based on the location characteristics. A jack and bore casing is required for the crossing under Apple Creek. The casing will add extra protection for the forcemain and will significantly reduce future maintenance costs in the event of a failure. Although only one forcemain is being constructed at this time, the City may install a parallel line in the future for added pumping capacity. In order to reduce future costs and construction complications, a parallel section of forcemain will be installed in the casing section and will be temporarily capped until future use.

Figure 2 – Preliminary Layout for Regionalization with Bismarck Alternative



7.1.5 Supplemental Parameter Monitoring

The Bismarck WWTP requires incoming wastewater to meet specific requirements. The City of Bismarck Title 11.1 Pretreatment Program ordinance states the maximum concentrations of parameters and potentially hazardous compounds. Table 2 lists the maximum concentrations of certain parameters that can be discharged to the sanitary sewer system, based on the Pretreatment Program.

Table 3 – Maximum Concentrations

Parameter	Limit
pH	Must not be less than 6.0
Total BOD	250 mg/L
TSS	250 mg/L
Benzene	0.05
BETX	0.75
Cadmium	0.09
Chromium (Total)	4.39
Chromium (IV)	4.39
Copper	2.5
Lead	0.94
Mercury	0.06
Nickel	0.79
Selenium	0.20
Silver	0.94
Zinc	7.93

On November 28, 2018, SEH met with the City of Bismarck regarding the potential connection of the Lincoln WWTF to the Bismarck sanitary sewer. Bismarck WWTP staff indicated that the TSS and ammonia levels were slightly above normal, and that additional testing may be required prior to connection. In addition, Bismarck may require a permanently will require flow metering of the pumped wastewater that enters their system. Therefore, the lift station will also have a metering vault with a magnetic flow meter downstream of the wetwell and valve vault.

Bismarck officials also noted that Lincoln may be required to conduct regular inspections (bi-annual or quarterly) on restaurant grease/sand traps to ensure traps are properly maintained.

7.1.6 Total Cost Summary

The proposed project requires new construction in addition to decommissioning and updating existing facilities. The costs associated with this alternative are estimated in Table 4.

Table 4 – Preliminary Opinion of Probable Cost

Total Cost Summary	Estimate of Probable Capital Cost
Duplex submersible lift station, controls, generator, grease removal, basket screen, chemical addition station, sampling station	\$803,000
8-inch forcemain, cleanouts, air release and cleanout manholes, and river crossing	\$2,106,400
Decommission and dredging of cells 1, 3, and 4	\$890,000
Repair cell 2 and conversion to equalization	\$625,000
Subtotal	\$4,424,000
Engineering	\$995,000
Material Testing	\$106,000
Land/Easement Acquisition	\$50,000
Mobilization, Bonding, Insurance	\$221,000
Contract, Permitting, etc.	\$88,000
Contingency	\$1,318,000
Total Capital Cost	\$7,212,000
*All values provided in 2020 dollar amounts	

The cost estimate is in terms of 2020 dollar amounts. Inflation should be considering when estimating the project cost in the future.

7.1.7 City Annual Operating Budget

As shown in Table 5 below, sewer charges account for over 99% of the City's sewer budget revenue with the remaining collected via penalties and late fees. Neglecting late fees, the City's annual sewer revenue for sewer charges in 2017 was \$231,197 and 2018 was \$262,053. 2019 and 2020 have similar and steadily increasing projections of \$279,740 and \$294,066 respectively. After expenses, the City consistently maintains revenue overages from \$27,402 in 2017, \$124,964 in 2018, and projected overages in 2019/2020 of \$49,170 and \$56,946 respectively. These budget numbers do not include hookup fees revenue.

Table 5 – Annual Sewer Budget

Category	2016	2017	2018	2019	2020
Sewer Charges	\$220,634	\$231,197	\$262,053	\$279,740	\$294,066
Late Fees/Misc.	\$2,267	\$489	\$728	\$700	\$7,000
Total Revenue	\$222,901	\$231,686	\$262,781	\$280,440	\$301,066
Total Expenses	\$188,278	\$204,284	\$137,817	\$231,270	\$244,120
Net Revenue	\$34,623	\$27,402	\$124,964	\$49,170	\$56,946